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Flexible Fiberoptic Pericardioscopy for the Diagnosis of Pericardial Disease

GEORGE T. KONDOS, MD, STUART RICH, MD, FACC, SIDNEY LEVITSKY, MD, FACC

Chicago, Illinois

Pericardiocentesis provides an etiologic diagnosis for pericardial effusions approximately 25% of the time. In seven patients with evidence of a large pericardial effusion of unknown origin without cardiac tamponade, a flexible fiberoptic bronchoscope was inserted through a subxiphoid incision after the effusion was drained. Pericardioscopy allowed visualization of all pericardial surfaces and made it possible to perform selective biopsy not limited to a subxiphoid window. It is a safe procedure that can permit distinction among benign, malignant and tuberculous origins of pericardial effusion.

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Pericardiocentesis often fails to provide an etiologic diagnosis for pericardial effusion (1); in fact, it may identify it only approximately 25% of the time (2). Pericardiocentesis can help identify the mechanism of increased venous pressure, provide a nonsurgical approach to the management of tamponade and enable the physician to rule out infectious or neoplastic diseases. The risks of pericardiocentesis are primarily related to direct cardiac puncture with subsequent hemopericardium and surgical intervention (3,4). To help increase the diagnostic yield without increasing the morbidity of the procedure, we developed a technique of flexible fiberoptic pericardioscopy to aid in the diagnosis of pericardial disease.

Methods

Study patients. The seven study patients, six female and one male, ranged in age from 15 to 68 years. On combined M-mode/two-dimensional echocardiography, each had evidence of a large pericardial effusion with a large echo-free space surrounding the heart without loculation. There was no evidence of clinical cardiac tamponade. All patients had a thorough history and physical examination as well as an admission chest X-ray film, electrocardiogram, complete blood count, tuberculin skin test and viral titers for echovirus, coxsackie virus and adenovirus. The pericardial effusion was of unknown etiology in all seven patients.

Pericardioscopic system. The scope system consists of a flexible fiberoptic bronchoscope, Olympus BF type 4B2, with an outer diameter of 4.8 mm, a separate 2 mm biopsy and suctioning channel and an angle lever to adjust the angle of viewing to 180° up and 100° down. The optical system consists of an eyepiece and a fixed focus lens with a depth of field of view of 3 to 50 mm. The camera system consists of an Olympus Television Camera System for endoscopy, the bronchoscope adapter and a beam splitter that allows one to observe the procedure. The rest of the portable unit consists of an Olympus high intensity light source for our scope, a camera control unit that allows for natural color balance, a television monitor to display the image and a videocassette recorder to provide instantaneous recording and replay. The camera is directly attached to the bronchoscope.

Technique. All patients were under general anesthesia; informed consent was obtained for all procedures, including pericardial stripping should it be deemed necessary. Once adequate anesthesia had been given, an incision was made over the distal sternum, xiphoid and upper abdomen. The anterior rectus fascia was opened, the xiphoid process removed and adequate hemostasis attained. A plane was dissected beneath the sternum using blunt dissection and the pericardium was then identified. The pericardium was opened with a pair of Metzenbaum scissors and the pericardial effusion was drained. Aerobic, anaerobic, fungal and tuberculous cultures were obtained. The bronchoscope was subsequently inserted into the pericardial sac. The epicardium as well as the anterior, posterior and lateral pericardial surfaces were visualized. The image was observed directly

From the Section of Cardiology, Department of Medicine and the Division of Cardiothoracic Surgery, University of Illinois, Chicago, Illinois. The data were presented at the 57th Annual Scientific Sessions of the American Heart Association, November 1984, Miami Beach, Florida.

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Address for reprints: George T. Kondos, MD, Section of Cardiology, Department of Medicine, University of Illinois at Chicago, P. O. Box 6998, Chicago, Illinois 60680.

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Table 1. Results of Flexible Pericardioscopy in Seven Patients

Patient	Preoperative Diagnosis	Pericardioscopy Findings	Final Diagnosis
1	Idiopathic pericarditis	Normal pericardium	Idiopathic pericardial effusion, normal biopsy
2	Sarcoidosis, pericarditis	Unable to pass scope	Sarcoid pericarditis
3	+ PPD, breast CA	Normal pericardium	Idiopathic pericardial effusion, normal biopsy
4	+ PPD, LUL infiltrate	Granuloma-studded pericardium	Bloody effusion, caseating granulomas by biopsy
5	+ PPD, adeno CA of lung	Shaggy appearing pericardium	Bloody effusion, adeno CA by biopsy
6	+ PPD, pericarditis	Normal pericardium	Bloody effusion, mild chronic inflammation by biopsy
7	CHF, diabetes, TIAs	Normal pericardium	Idiopathic pericardial effusion, normal biopsy

Adeno CA = adenocarcinoma; CA = carcinoma; CHF = congestive heart failure; LUL = left upper lobe; +PPD = positive purified protein derivative; TIAs = transient ischemic attacks.

through the scope, which was coupled to a video monitor and recording system in which permanent recordings were made. Pericardioscopy-guided biopsy was performed on normal- and abnormal-appearing areas of the pericardium. The bronchoscope was then removed and, in some patients, a chest tube was left in place for further drainage. After further drainage, the incision was closed.

Results

The clinical findings in our seven patients including the preoperative diagnosis, pericardioscopic findings and final diagnosis are listed in Table 1. The scope was easily maneuvered by our cardiothoracic surgeon with continual visual monitoring. In Patients 1, 3, 6 and 7 the pericardial surfaces appeared smooth and glistening. In Patient 2 the scope could not be passed because of dense pericardial adhesions. Pericardial biopsy revealed noncaseating granulomas consistent with sarcoidosis. Pericardial fluid culture in all patients was unrevealing. Figure 1 is a photograph taken through the bronchoscope of Patient 4, who presented with a positive purified protein derivative skin test and a left upper lobe infiltrate. The pericardium is studded with yellowish lesions that, on biopsy, proved to be caseating granulomas, without evidence of tubercule bacilli. The sputum and urine cultures in Patient 4 were positive for tuberculosis.

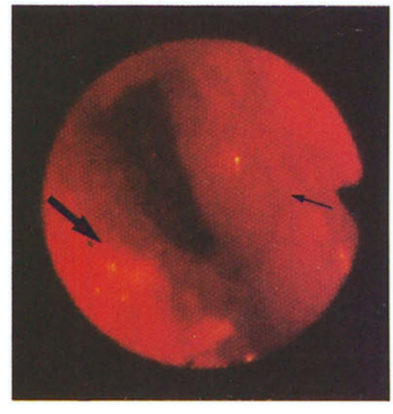
The epicardial coronary arteries and epicardial fat could be glimpsed in some patients. We were also able to well visualize the right atrial surface and the superior vena cava. Small focal hemorrhagic areas, occasionally demonstrated on the epicardial surface, may have resulted from irritation by the scope itself. No morbidity was associated with the procedure, including cardiac perforation or trauma, hemodynamic embarrassment or cardiac arrhythmias. There were no postoperative complications.

Discussion

Pericardiocentesis has been associated with significant morbidity and mortality. Krikorian et al. (1) reported an overall complication rate of 8%. We propose a technique to allow visualization of the pericardial surfaces and thus increase the benefit/risk ratio of pericardiocentesis.

Limitations. The limitations of the technique are in part related to the scope and the optical system. The Olympus bronchoscope is designated for viewing through air, not liquid. For that reason, the pericardial effusions in the current study were drained before visualization was attempted. The depth of field of view of the current optical system is fix-focused between 3 and 50 mm and best in the 15 to 45 mm range. Because of the small size of the pericardial space, for sharp visualization, the depth of field of view should be

Figure 1. Patient 4. Photograph taken during pericardioscopy through the bronchoscope showing both pericardial (**large arrow**) and epicardial (**small arrow**) surfaces. The yellowish studded areas were biopsy-proved caseating granulomas consistent with tuberculosis.



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fix-focused between 1 and 20 mm and optimally around 10 mm. The limitations of our current study also relate to the small number of patients and a limited variety of diseases.

Clinical utility of pericardioscopy. The role of pericardioscopy in the diagnosis of pericardial disease remains to be clearly defined. It may be of value in patients presenting with a positive purified protein derivative skin test, abnormal chest X-ray film and pericardial effusion. In patients presenting with malignancy previously treated with either chemotherapy or radiation it may guide further therapy by distinguishing between recurrent malignancy and a benign pericardial effusion. Approximately 50% of patients with pericardial disease and underlying malignancy may have a nonmalignant pericardial effusion (6–8). Although none of our patients had lymphoma, analysis of the pericardial effusion with respect to cytology is usually nondiagnostic. Pericardial biospy usually reveals the diagnostic information; however, it seems that selective pericardioscopy-guided biopsies would further increase the diagnostic yield. Even though our series was very small, pericardioscopy appears to be a safe procedure and has the potential to allow the distinction among benign, malignant and tuberculous causes of effusion. Furthermore, pericardioscopy permits performance of selective biopsies not limited to a subxiphoid window.

The patients in our present study had a large pericardial effusion. It is hoped with the development of a better scope system that this technique may be performed percutaneously, without general anesthesia, in patients with a small or no pericardial effusion.

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